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2. That the translator responsible for the attached translation is well acquainted with the German and English languages.

3. That the attached is, to the best of RWS Group plc knowledge and belief, a true translation into the English language of the specification in German filed with the application for a patent in the U.S.A. on

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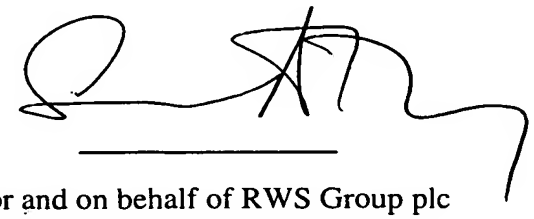
4. That I believe that all statements made herein of my own knowledge are true and that all statements made on information and belief are true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application in the United States of America or any patent issuing thereon.



For and on behalf of RWS Group plc

The 24th day of September 2003

10680 US/VII

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"Receiving part of a fluid plug-in coupling"

The present invention relates to a receiving part of a fluid plug-in coupling ("fluid" is to be understood as meaning any hydraulic or gaseous flow medium), comprising a socket housing having a plug-in opening for a plug part and having a retaining device for releasably fixing the plugged-in plug part in place, the retaining device having a retaining element which is mounted in the socket housing and has radially elastically deformable retaining sections for latching engagement behind a radial retaining step of the plug part, and a release element which is secured in an axially displaceable manner relative to the socket housing via latching means, the release element engaging by means of an inner release section in the plug-in opening and, for release purposes, acting against the retaining sections of the retaining element.

EP 0 727 027 B1 describes a rapid-action coupling of this type, in which the release element comprises an inner sleeve and an outer sleeve. As a release section, the inner sleeve acts against the retaining sections of the retaining element. In this connection, the plug part may be released unintentionally under certain operating conditions, as a result of which the particular fluid can also leak out.

The present invention is based on the object of providing a receiving part of the mentioned type which has increased security against unintentional release and leakages.

According to the invention, this is achieved by a securing element in such a manner that the release

element is blocked in a securing position against a release movement and is unblocked in an unblocking position for a release movement. This prevents unintentional release. On the contrary, for release purposes, the arrangement must first be transferred from the securing position into the unblocking position and only then can the release element be moved axially against the retaining sections of the retaining element.

In addition to this, an integrated blocking valve can advantageously be provided which automatically closes in the decoupled state and is automatically opened by the plug part being plugged in. As a result, leakages are largely avoided even in the decoupled state.

Further advantageous design features are contained in the subclaims and in the following description.

The invention will be explained in greater detail with reference to preferred exemplary embodiments which are illustrated in the drawing, in which:

Fig. 1 shows a half section (upper half) of a first embodiment of a receiving part according to the invention with the plug part plugged in and blocked,

Fig. 2 shows a half section (corresponding lower half) of the receiving part in a release position of the release element for unblocking the plug part,

Fig. 3 shows a half section similar to fig. 2 with the plug part somewhat pulled out,

Fig. 4 shows an end view of the receiving part (plane IV-IV according to figs. 1 and 2),

Fig. 5 shows a perspective exploded view of certain individual parts,

Fig. 6 shows a further view as in fig. 5 from a somewhat different viewing direction,

Fig. 7 shows a view of the fitted individual parts according to figs. 5 and 6 in a securing position,

Fig. 8 shows the arrangement according to fig. 7 in an unblocking position,

Fig. 9 shows a variant embodiment of the receiving part according to the invention in a longitudinal section similar to figs. 1 and 3, the blocked position being illustrated in the upper half of the figure (fig. 9a) and the release position being illustrated in the lower half (fig. 9b),

Fig. 10 shows a partial side view of a further embodiment of the plug-in coupling in the release position,

Fig. 11 shows an end view in the arrow direction XI according to fig. 10,

Figs 12 to 14 show longitudinal sections of the plug-in coupling in the blocked position, specifically
fig. 12 in the section plane A - A according to fig. 11,

fig. 13 in the section plane B - B according to fig. 11, and
fig. 14 in the section plane C - C according to fig. 11.

In the various figures of the drawings, identical parts are always provided with the same reference numbers.

As emerges initially from figs. 1 to 3 and also fig. 9 and figs. 12 to 14 in each case, a plug-in coupling comprises a receiving part 2 and a plug part 4. However, the invention relates only to the receiving part 2 while the plug part 4 has a standard design ("SAE plug") in the form of a section of pipe which has an annular projection 8 so as to form a radial retaining step 6 on its outer circumference.

The receiving part 2 comprises a socket housing 10 having a plug-in opening 12 for the plug part 4 and having a retaining device 14 for releasably fixing the plugged-in plug part 4 in place. For this purpose, the retaining device 14 has a retaining element 16 which is mounted in the socket housing 10, this retaining element 16 for its part having radially elastically deformable retaining sections 18 for latching engagement behind the retaining step 6 of the plug part 4. It is preferable if a plurality of radially symmetrical retaining sections 18, for example eight retaining sections, are provided (see fig. 11), but only two of them are illustrated in each case in figs. 5 to 8. The receiving part 2 furthermore has a release element 20 which is secured in an axially displaceable manner relative to the socket housing 10 via latching means 22. In this case, the release element 20 engages by means of an inner release section 24 in the plug-in opening 12 and, for the purpose of releasing the blocked plug part 4, acts here against the retaining sections 18 of the retaining element 16 in such a

manner that they can be expanded radially so as to unblock the plug part 4.

According to the invention, the receiving part 2 has a securing element 26 in such a manner that the release element 20 is blocked in a securing position (figs. 1, 7, 9a and 12-14) against an axial release movement and is unblocked in an unblocking position (figs. 2, 3, 8, 9b and 10) for a release movement. The securing element 26 and the release element 20 are preferably rotatable about the coupling axis 28 relative to each other between the securing position and the unblocking position. In this case, on the one hand, the release section 24 of the release element 20 is designed as a hollow cylindrical inner sleeve and, on the other hand, the securing element 26 is designed as a ring (or annular disk) which coaxially surrounds the inner sleeve and is arranged axially in front of the end side of the socket housing 10.

As can best be seen in the detail views of figs. 5 to 8, the release element 20 has at least one radial securing projection 30 on the outer circumference of the release section 24. In the embodiment illustrated, four radially symmetrical securing projections 30 are provided. Each securing projection 30 rests on an end surface 32 of the securing element 26 in the securing position, but can be guided axially through a corresponding radial recess 34 of the securing element 26 in the relatively rotated unblocking position. In this connection, it is furthermore advantageous if the end surface 32 of the securing element 26 has a wavy contour in the direction of rotation in such a manner that a bearing region for the associated securing projection 30 (in the securing position) is formed in each case in the region of an axially recessed wave trough 36, and the axial recess for passing the securing projection 30 through (in the unblocking

position) is formed in each case in the region of an axially raised wave crest 38.

The securing element 26 is preferably connected to the socket housing 10, in particular latched, in a manner secured against rotation. For this purpose, the securing element 26 preferably has at least two axial latching arms 40 which engage in the socket housing 10 and engage behind an edge. According to fig. 4, the socket housing 10 has recesses 42 on the end sides for the latching arms 40.

The release element 20 is preferably secured indirectly in the socket housing 10, specifically via the retaining element 16 in the embodiment according to figs. 1 to 8. For this purpose, the retaining element 16 has at least one, or as illustrated two, radial retaining arms 44 which engage in a retaining groove 46 formed on the outer circumference of the inner sleeve 24. The retaining groove 46 is dimensioned here in the axial direction to be of such a width that it permits the axial release movement of the release element 20 in spite of the retaining arms 44 being in engagement.

According to the invention, the receiving part 2 furthermore has an integrated blocking valve 50 which automatically closes the fluid passage in the decoupled state and opens by the plug part 4 being plugged in. The blocking valve 50 has an axially moveable valve element 52 according to figs. 1 to 3 and 9 with a bearing section 54 for the plug part 4. According to figs. 1 to 3 and 9, this bearing section 54 is guided displaceably within the socket housing 10 for the purpose of guiding the plug part 4. For this purpose, the bearing section 54 is preferably of essentially hollow cylindrical design and has an expanded holder 56 for a free end region of the plug part 4. As a result, in its state in which it is guided with a relatively

low amount of clearance into the holder 56, the free end region of the plug part 4 is guided within the socket housing 10 via the bearing section 54. The blocking valve 50 is prestressed in the closing direction by a valve spring 58.

A few more variant embodiments will be explained.

In the embodiment according to fig. 9, the release element 20 is latched onto the outside of the outer circumference of the socket housing 10.

In the embodiment illustrated in figs. 10 to 14, the release element 20 is secured indirectly via the securing element 26. For this purpose, the release element 20 has at least two axially extending, diametrically opposite retaining arms 60 which are moveable in a resilient manner in the radial direction and have radially outwardly directed latching lugs 62 at their front ends, which protrude into the receiving part 2. Reference is made in this respect in particular to fig. 14. The securing element 26 has a radially inwardly pointing annular collar 64 with an inner bearing surface 66. The release element 20 can be latched to the latching lugs 62 of the retaining arms 60 through the annular collar 64, the latching lugs 62 also serving to secure the release element 20 against being pulled out, by bearing against the annular collar 64. In addition, provision is advantageously made for the release element 20 to be acted upon by a spring force F which acts axially in a release-actuating direction (see fig. 14). In the embodiment illustrated, this is achieved by the resilient retaining arms 60 having outer, cone-like oblique surfaces 68 which interact radially with the inner bearing surface 66 of the annular collar 64 of the securing element 26 to produce the spring force F. By means of this advantageous refinement, the release element 20 is

constantly pulled into the receiving part 2 by the spring force F, so that the securing projections 30 are always retained in the wave troughs 36 and can only be transferred counter to the spring force F into the region of the wave crests 38.

In this embodiment according to figs. 10 to 14, provision is furthermore made for the valve element 52 of the blocking valve 50 to interact in its closed position (not illustrated) with a sealing arrangement 70 - in this example formed by two axially spaced apart sealing rings - which is also provided, in accordance with the illustration in the drawings, for sealing the plugged-in plug part 4.

As an alternative, the release element 20 may also be connected, in particular latched, to the retaining element 16 in a manner secured against rotation.

The end contour of the securing element 26 with the recesses 34 may also be formed directly (integrally) on the socket housing 10, so that the socket housing 10 has at the same time the function of the securing element 26.

The retaining element 16 can have additional latching means for the axially resilient fastening of the release element 20. In addition, the retaining element 16 can have additional spring arms which additionally hold a sealing closing bushing (not illustrated).

A dirt seal 48 is advantageously provided which can be formed by a thin rubber disk which is inserted between the socket housing 10 and the securing element 26 and is matched on the inside to the contour of the plug part 4. In the embodiment according to fig. 9, a sealing element 48 of this type can also be arranged axially in front of the end side of the socket housing

10 in the clearance between the inner sleeve 24 and the outer latching means 22 of the release element 20. However, this sealing element 48 has to take into account the installation space for the securing element 26. Furthermore, a radial sealing lip can also be arranged directly on the release element in such a manner that it extends radially inward and comes to rest on the circumference of the plug part 4.

The receiving part 2 according to the invention can be operated as follows.

a) Single-handed operation

For single-handed operation, either the securing element 26 or the release element 20 has to be fixed in place relative to the socket housing 10 in a manner secured against rotation. Rotation of the release element or of the securing element causes the securing projections 30 to pass out of the stable position of equilibrium (wave trough) into a position in which the securing projections 30 can be aligned in the region of the wave crests with the recesses 34 and can thus be passed axially through them.

b) Two-handed operation

In this case, neither the securing element 26 nor the release element 20 is fixed in place relative to the socket housing 10 in a manner secured against rotation. The two elements therefore have to be held and moved manually during the relative rotation.

The block can be checked by

a) the distance between the release element 20 and securing element 26

b) optical features (for example colored identification) on the securing projections 30 and/or on the inner sleeve 24 of the release element 20.

The invention is not restricted to the exemplary embodiments which have been illustrated and described, but also comprises all embodiments acting in an identical manner in the sense of the invention. Furthermore, the invention has also not yet been restricted to the combination of features defined in claim 1, but rather may also be defined by any other desired combination of specific features of all of the individual features disclosed as a whole. This means that in principle virtually any individual feature of claim 1 can be omitted or can be replaced by at least one individual feature explained elsewhere in the application. In this respect, claim 1 is to be understood only as an initial attempt at putting an invention into words.